ANALYSIS OF THE RISKS OF COLORECTAL CANCER ASSOCIATED WITH THE CONSUMPTION OF DIFFERENT TYPES OF MEAT

Universitat Autònoma de Barcelona

Ester Vives Cobo - June 2017

FACULTAT DE VETERINÀRIA

Introduction

A study, realized by the International Agency of Research of the Cancer (IARC) to instances of the WHO, classifies the red meat as a probably carcinogenic (Group 2A) and the processed meat as a carcinogenic (Group 1) for human. This article generated a lot of debate, fundamentally because it does not associate the danger with the risk for the consumption of meat. However, the meat provides several essential nutrients in our diet, such as iron and B12 vitamin.

Objectives

- To understand the association between meat consumption and colorectal cancer (CRC)
- To study the possible carcinogenic mechanisms of red and processed meat

Meta-analysis

Authors	Red meat	Processed meat	White meat
Aykan, 2015	+	+	-
Norat et al., 2005	+	+	-
Mejborn et al., 2016	-	-	-
Wolk, 2016	+	+	n.d.
Richi et al., 2015	+	+	n.d.
Chan et al., 2011	+	+	n.d.
Johnson et al., 2014	+	+	n.d.
Bernstein et al., 2015	-	+	n.d.
Batlle et al., 2016	+	+	n.d.
Joshi et al., 2015	-	-	n.d.
Parr, Hjartaker, Lund, & Veierod, 2013	-	+	-
D. Alexander et al., 2015	-	n.d.	n.d.
Smolińska & Paluszkiewicz, 2010	+	n.d.	n.d.
Alexander & Cushing, 2010	-	n.d.	n.d.
Manjinder S. Sandhu, Ian R. White & McPherson, 2001	+	+	n.d.
Norat, Ukanova, Errari, & Iboli, 2002	+	+	n.d.
World Cancer Research Fund/ American Institute for Cancer Research, 2007	+	+	not enough studies
Larsson & Wolk, 2006	+	+	n.d.
Huxley et al., 2009	+	+	-

Table 1. Increased CRC risk for consumption of different types of meat. +: there is a risk; -: there is not risk; N.d: no data

Authors	Red meat	Processed meat
Aykan, 2015	>500g/week or >70g/day	n.d.
Norat et al., 2005	high	n.d.
Wolk, 2016	high	n.d.
Richi et al., 2015	high	n.d.
Chan et al., 2011	>100g/day	>50g/day
Johnson et al., 2014	high	n.d.
Batlle et al., 2016	high	alt
Smolińska & Paluszkiewicz, 2010	>50g/day	n.d.
Norat et al., 2002	high	high
World Cancer Research Fund/ American Institute for Cancer Research, 2007	>500g/week	n.d.
Larsson & Wolk, 2006	>120g/day	>30g/day
Huxley et al., 2009	high	high

Table 2. Increased CRC risk linked to the increased meat consumption. High: unspecified quantities; N.d .: no data

Potential mechanisms

N- nitroso compounds

- Temperature-dependent
- React with DNA
- Found in cured meat, vegetables and water
- Controversial studies

Heterocyclic amines and polycyclic aromatic hydrocarbons

- High temperature treatment
- Mutagenic agents
- Produced in white meat
- Controversial studies

Iron

- Heme group: pigment
- Peroxidation of lipids
- Reactive oxygen species (ROS)
- Inflammation factors
- Causes the mutations in KRAS oncogene and APC gene
- Vegetables and calcium have a protective effect

Fat

- Produce secondary bile acids (BAs)
- Unbalanced diet is the principal cause of:
  - Damage DNA
  - Cause mitotic and metabolic stresses in the mucosa of the colon
- Non-consistent studies

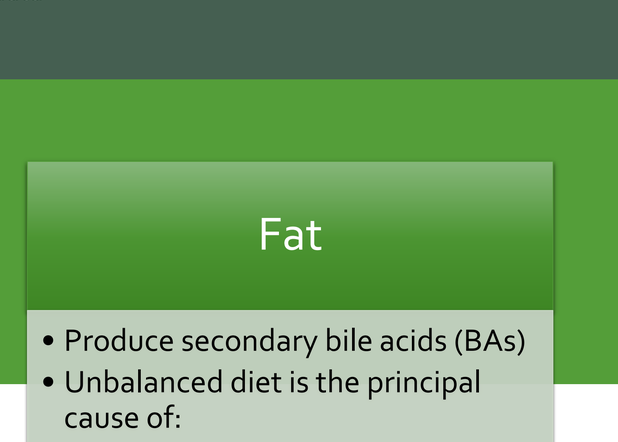
Intestinal microbiota

- Diet is the key role of well-balanced microbiota
- Chronic intestinal inflammation
- Chronic production of bacterial metabolites
- Production of BAs
- Controversial studies

Epigenetic changes

- Alteration of histone deacetylase 2
- Formation of NOCs
- Formation of DNA Adduct
- Mutation of APC gene
- Production of ROS
- Genetic predisposition

Benefits of meat



Conclusion

Several analyzed studies have concluded that an increased risk of CRC is associated with red and processed meat consumption, and especially when the consumption of red meat is high. However, it should be noted that some factors, such as diet and genetics, can not be excluded from the studies, and may alter the results. And further studies conclude that there is no relationship.

All these mechanisms could be the cause of CRC. However, some studies claim that the results are inconsistent. To sum up, having a balanced diet and a moderate consumption of red and processed meat reduce and/ or cancel the carcinogenic effects.